Connector Summit Results – Way Ahead
Seabasing OAG – 22 July 2014

Agenda

- Summit Purpose/Endstate
- Planning Factors
- Methodology/Breakout Group Framework
- Summary
- Way Ahead

Summit Purpose/Endstate

- Purpose: Facilitate discussion and aggressively explore the full range and depth of future connector possibilities, to include innovative approaches to employing current connectors by involving stakeholders from both government and industry
- Endstate: <u>Inform the development of future sea-based connector strategy with consideration given to:</u>
  - Time to develop selected connectors
  - Technical maturity
  - Platform interoperability
  - Rough order of magnitude cost profiles
  - Rates of buildup of combat power ashore to

Planning Factors

- Programs
  - USMC supports current connector Programs of Record
  - LCAC SLEP, SSC, SC(X)(R)
- Concepts
  - Employment concepts contained in EF-21
  - Increased operating distances from ship to shore
  - Multi-role/multi-mission connectors (intelligence, fires, logistics)

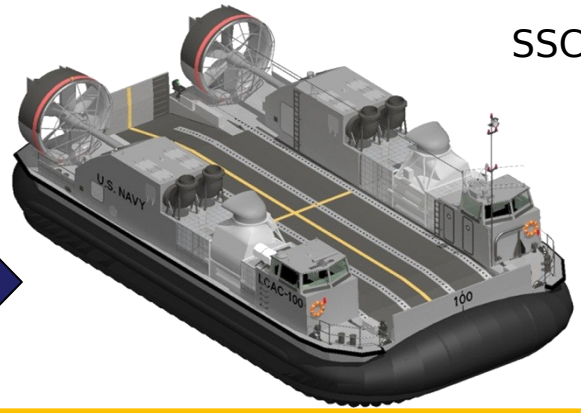
Ship to Shore Mobility

Recapitalization of primary surface ship to shore connectors

LCAC (SLEP)

Ship to Shore Connector (SSC) replaces LCAC to retain high speed over the shore assault capability--***from sea basing ranges***.

SSC

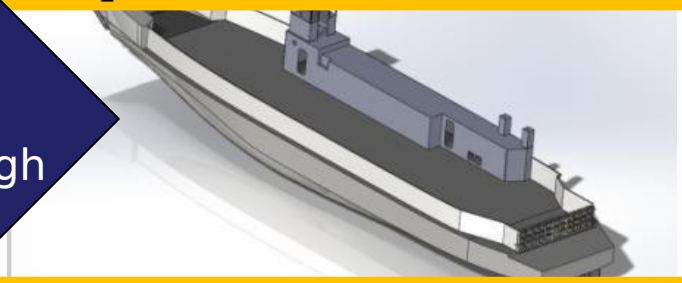


- **Increased payload, temperature and sea state parameters (*74 tons; 100 F; high SS 3*)**
- **72 craft procurement ~$ 4.1B through 2027**
- **Under contract for detail design with options for the first 9 craft**

LCU-1610 Class

Surface Connector (X) Replacement (SC(X)R) recapitalizes a rugged, persistent, economical, high capacity utility landing craft.

SC(X)R



- **Analysis of Alternatives in progress**
- **Anticipate 32 craft procurement beginning 2018**

Connector Summit Break-out Group 1 Technical & Programmatic Survey

Connector:	Bin	Interoperability - well deck (W); beach (B) - B+ goes onto beach; LO/LO (L); MLP (M); RRDF (R);	Time	TRL	Hull form	Design Maturity (Concept or Built)	Hullform Material	Component Material	Propulsion	Propulsion Method	Speed	Sea State	External Dimensions (LxW/BxH) ft	Length to Beam Ratio	Draft (ft) /Beach Access	Range (nm)
UHAC	ATF/MPF	W, B+, L (top removed), M, R	4-5 years for prototype	5	D -Capative Air Cell	1/2 Scale Demonstrator			Gas turbine, diesel, or hybrid drives	Captive Air Cell Tracks	>20	>SS-3	L=92; B=48	1.91	6-8 / Amphibious, beach, marsh, mud flats.	>200
Caimen-90	ATF	W, B, L, M,R	2 years for production unit representative	4	D	Design/Models	Al	N/A	3 diesels	Waterjet	22 (loaded); 40 (light)	Unrestricted up to SS-4	L=98; B=25	3.92	4.91	250
LCAT	ATF	W,B,L	FMS - 4-5 years	7	D / C	Built/Fielded	Al		4 diesel	Waterjet	18(loaded); 30 (light)	SS-5	L=98; B=41.3	2.37	7.9 (Fully loaded Caterman); 3.37 (Fully loaded landing)	600
Concept A	ATF	W, B, L, M,R	3 years for production unit representative	7	D	Design	Steel		2 diesels	Waterjet / Bow thruster	11.5 (loaded); 12.5 (light)	SS-3	L=135; B=30	4.5	5.5	1,391 @ 8 kt
LCU-Future A (Al)	ATF		Concept developed at meeting - fast LCU made out of aluminum	1												
LCU (Folding)	ATF / Splass	W, B, M,R		1	D	Design Concept	UNK	UNK	2 diesels	Retractable twin props / stern-thrusters	19 (loaded); 20 (medium load)		L=270 (unfolded) / 143 (folded); B=22	22.27 (unfolded); 6.5 (folded)	4.5 (unfolded); 5.5 (folded)	1500 @ 20 kt

BG#1 Technical Framework

AMPHIBIOUS TASK FORCE

- Ultra Heavy-lift Amphibious Connector
- Caimen-90
- L-Cat
- Concept A
- LCU-F
- Heavy Lift LCAC
- Hover Barge
- LC-Fast (A)

MARITIME PREPOSITIONING FORCE

- UHAC
- Joint Universal Causeway Interface Module
- Improved Navy Lighterage System (INLS)
- Hover Barge
- LCU-F & LC-Fast (A)
- Transformational Craft (T-Craft)
- Army Watercraft (LCM-8, LCU-2000, LSV)
- Joint High Speed Vessel

SHORE TO SHORE

- Caimen-200
- Commercial Hybrid A/C (20, 90, 500 ton)
- Transformational Craft
- Army Watercraft (LCU-2000, LSV)
- Joint High Speed Vessel

ENABLER (Splash/Landing)

- LCU-F (splash)
- Light Weight Modular Causeway System (LMC
- RRDF/LCAC, Flexible Sea-based Force Proj. (F
- Joint Universal Causeway Interface Module
- INLS & INLS - MLP Interface
- Advanced Mooring System
- Interface Ramp Technology (IRT) (SS3, JHSV)
- IRT (JHSV splash) float, LMCS base, removal
- FSFP (JHSV splash)
- Joint High Speed Vessel
- LCAC ramp & SSC ramp (splash)
- Sea train
- Havic (ACV high-speed sled)

BG#2: Operational Framework

- EF-21: future connectors are multi-mission/multi-role capable
- MEB as deployed base unit; Rein Company as base unit of employment[1]

** Potential Decision Point

- Accept one or more types of connectors[2]?
  - Assault connectors (AC) with primary mission of landing amphibious forces with speed and payload focus. Or…
  - Support connectors (SC) with primary mission of supporting the landing force with payload over speed
  - Cannot be a niche capability
    - Open architecture design

Future Connector Desired Capabilities

- ‘Beyond or Over the Beach’ capability requires study
- Connectors ISO EF-21 requires study
- Desired characteristics influence craft design
  - (AC) Assault Connector to support landing Assault Echelon
  - (SC) Support Connector to move bulk capabilities from Sea Base to shore
  - (B) characteristics desired for both connectors
- If a single connector is pursued, all desired characteristics are applicable

Summit Summary

- **Over 165 participants:**
  USMC: HQMC DCs, CD&I, MARFORs, MARSOC, MCIA, MCWL, MARCORSYSCOM
  USN: OPNAV, NAVSURWARCEN, NAVSURFLANT, NAVWARDEVCOM, NAVSEA, NAVBEACHGRU, NWC, PEO Ships
  Foreign Military: Netherlands, UK, France, Germany, Australia,
  Industry: Lockheed Martin, American Systems, GD NASSCO, Nichols Brothers Boat Builders, Fincantieri Marine Group, Textron, UK's BMT Defence
- **Methodology (4 day Summit 11-14 March 2014):**
  - MCPP Framework w/following planning factors:
    - USMC supports current connector Programs of Record- LCAC SLEP, SSC, SC(X)(R)
    - Expeditionary Force-21 driven; connector enhancements; increased operating distances from ship to shore; multi-role/multi-mission connectors
  - Problem Framing: 2 days of common briefs covering EF-21, ACV, current/US Army watercraft/foreign/possible connectors, hybrid airship technology, & potential connector enhancements
  - COA Development: 2 days of breakout sessions (technical SMEs and operational employment SMEs) to determine capabilities development COAs for near and long term connectors and connector related

y Ahead (1 of 2)

- Platform Integration. IAW Naval Board direction, fully explore alternative ships/platforms & connectors.

- Concept Analysis & Wargaming. Leverage upcoming Naval Services Wargame to examine alternative platforms and connectors for engagement & littoral maneuver.

- NAVSEA Support. Connector analysis and engineering support through NAVSEA Warfare Centers. Analyze LCAC ramp to determine potential engineering changes to enhance ACV splash capability.

- Surface Connector Strategy. Refine and align

NAVSEA Warfare Center
Ship to Shore Testing and Analysis

- AAV launch off LCAC stern- 1987
- Connector throughput study 2003
- Heavy Lift LCAC – 2004
- SEABEE Lift of LCAC
- Mighty Servant 3 - LCAC Interface 2012
- Gripe Study- 2010
- Habitability Study 2012
- Shock Mitigation studies - MK 5, NSW RHIB, LCAC
- Well Deck Thermal Testing and Analysis – LSD, LHD, and LPD 17
- Shock-mitigated seat study
- LCAC motion characterization study for SSC

NAVSEA Warfare Center
Connector Development, Analysis, Engineering

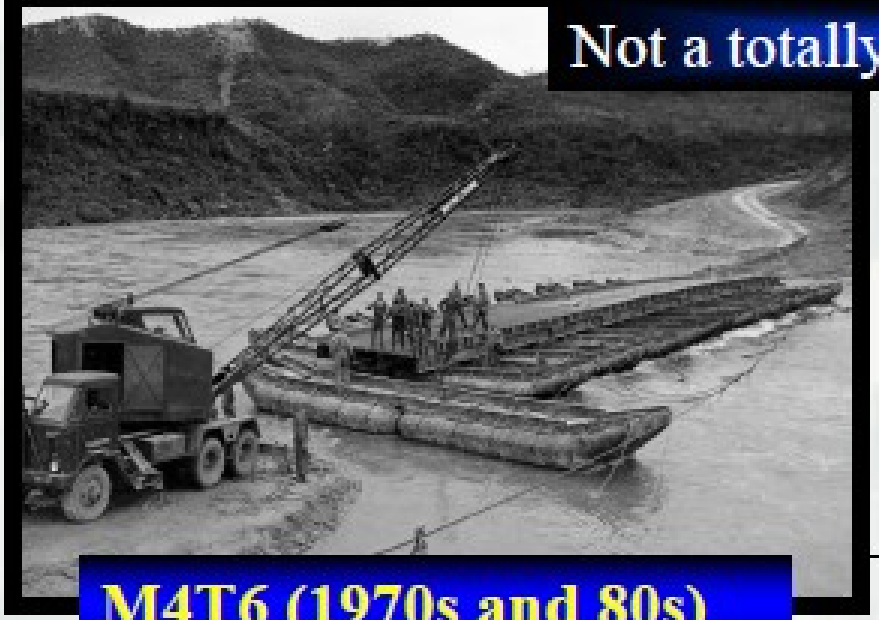
- **LCAC and SSC Ramp Analysis, Design, Fabrication, and Testing**
  - Accommodate quicker and safer launches of AAV & potentially ACV
- **Operational Planning , Throughput Analysis and Recommendations**
  - Modelling & Simulation/ Analysis of Physical logistics (well deck; connectors, non-connector platforms, cargo, MLP, Air Lift, MSC Support etc.)
    - To include ship to objective and logistics supportability, identify bandwidth bottlenecks
  - M&S/Analysis of C2 (Blue/Green Interfaces; data throughput--clogging the tubes), enhanced collaboration across the force
  - Operational Planning Tool (shipboard cargo flow/connector movement) tool, *informed* by prior modeling, possibly linked to or supplementing JMPS-E
- **Throughput/Tempo Enhancements**
  - Rapid gripes, lightweight gripes, training, decision support, SEAOPS, rapid cargo spotting tools
  - Common Navigation software for Amphibious Connectors

y Ahead (2 of 2)

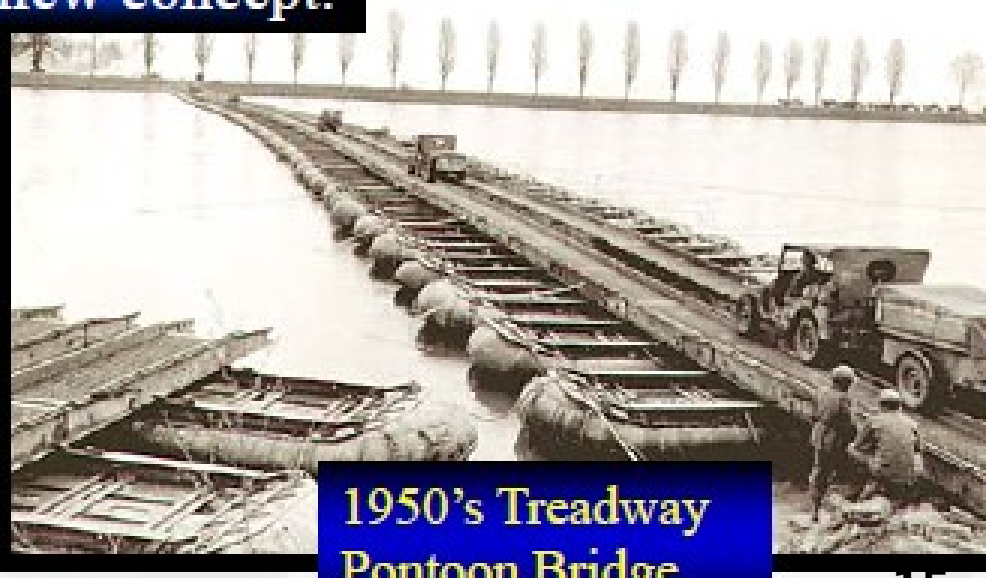
- **Request for Information to Industry:**
  – RFI posted in Jun on FedBizOpps to solicit white papers on systems/technologies applicable to EF-21 littoral maneuver capabilities.
  – With ONR examine/assess RFI responses; deadline is 30 Aug. Pursue promising ideas.
  – Conduct EF-21 ship to shore movement analysis
- **In Conjunction with NAVSEA Warfare Centers:**
  –Determine if enhancements can be made to LCAC AAV/ACV launch capability
- **Potential Near to Mid-term Enhancements:**
  –Lightweight Modular Causeway System
  –Roll-on Roll-off Discharge Facility/LCAC Interface
  –Flexible Sea base Force Projection
  –Improved Navy Lighterage System/Mobile Landing Platform interface
  –LCAC/SSC “station” concept
- **Long Term:**

Lightweight Modular Causeway System

Not a totally new concept.

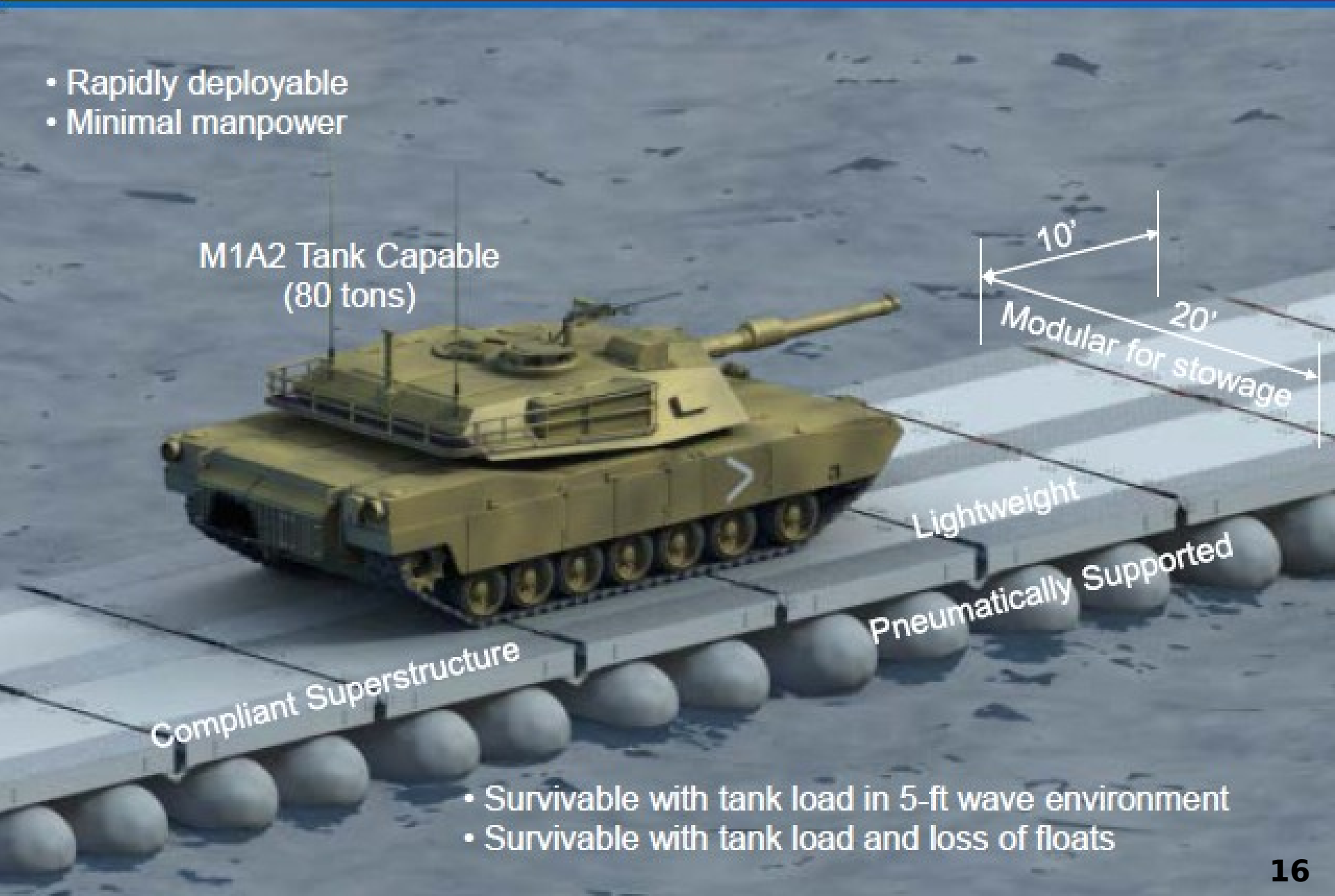


M4T6 (1970s and 80s)

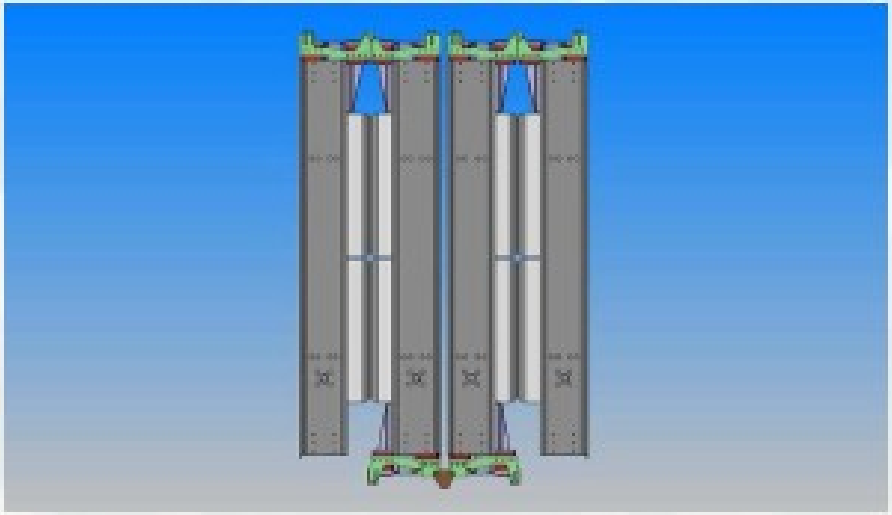


1950's Treadway Pontoon Bridge

Lightweight Modular Causeway System



LMCS Full Scale JHSV Deployment Simulation



- Fan-fold mechanism to accommodate 4 pack stowage (8'x20'x~12') and emplacement by crane.
- "Four-pack" configuration within operational limits of JHSV on-board crane.
- Employment from JHSV on-board crane is estimated at 240 ft per 3 hours.
- Demonstrated employment from simulated JHSV on 22 Sep 09, Pearl Harbor, HI

INLS R&D Efforts

- *INLS/LCAC Interface, Loading Platform*
  ONR & NSWC Carderock, Unfunded

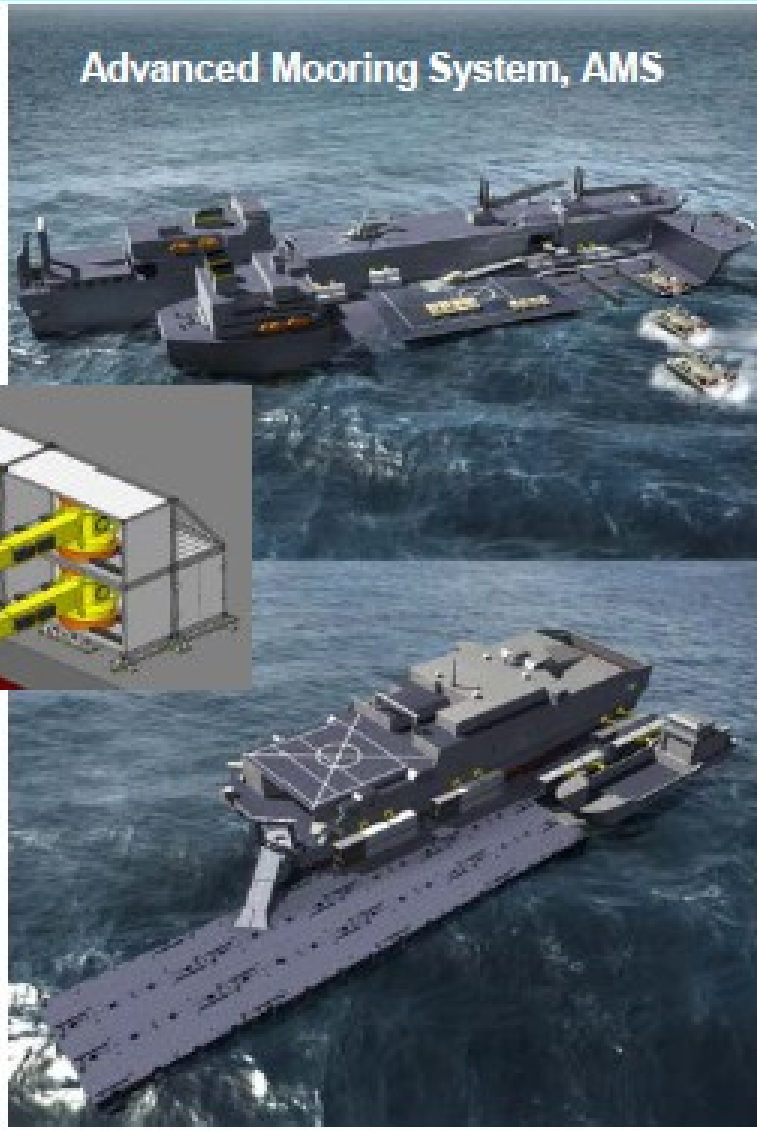
- *JUCIM, Joint Universal Cargo Interface Module*
  USTRANCOM/ERDC & NSWC Carderock, Ongoing

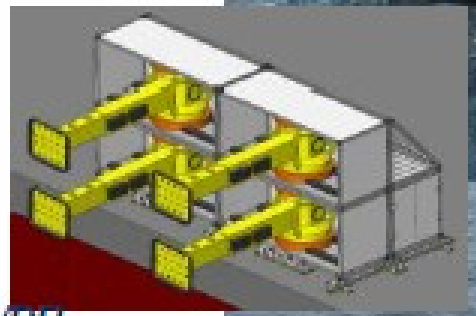
- *Advanced Mooring System (AMS)*, Ongoing
  PMS-385/ONR & NSWC Carderock,
  - Vessel Demo FY15

- *Sea State Monitoring & INLS Limits Study*,
  NAVFAC, Ongoing
  - Data collection continued during BS'14

- *Double Wide CMs for 40', 45', 48' and 53' for HA/DR Container Handling*, NAVFAC, Ongoing

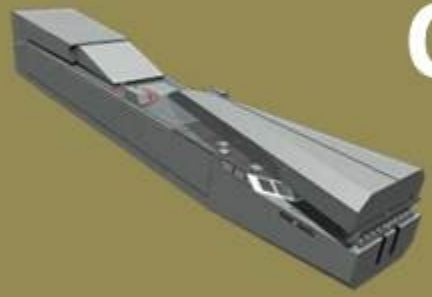
- *ELCAS(M)-INLS Interface*, NAVFAC, Complete

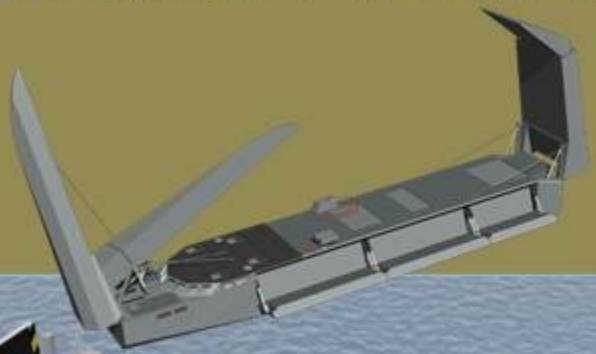


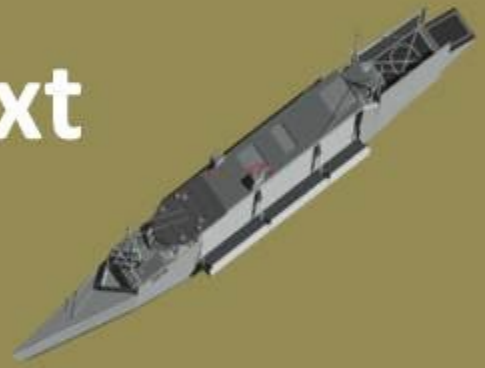


Caimen®-90 Fast
A novel, Trimaran monohull constructed from aluminium. Design originally developed to meet UK Fast Landing Craft requirement
Key features and benefits include:
Operation at high speeds with heavy payloads – a step change in capability
Excellent seakeeping and manoeuvring characteristics – less than 1 knot speed reduction in sea state 4
Inherent beached stability – safe and efficient delivery of troops and vehicles
Good access to machinery – reduces the maintenance burden
Three high speed diesel engines coupled to waterjets – redundancy and increased availability

Connector After Next







Caimen®-200
An innovative solution towards the challenge of moving heavy payloads to the shore that tackles the design conflict of requiring both stable beaching and a speed of advance that can match other naval platforms
Key features and benefits include:
Active ramp provides much improved hydrodynamic performance and energy efficiency
Simple and robust design allows enduring and flexible capability
Durability through stringent attention to structural detail and continuity
Modular payload capability – a flexible and adaptable amphibious asset

Connector After Next

Concept Based Desired Capabilities

Development Framework

- EF-21: future connectors are multi-mission/multi-role capable
- MEB as deployed base unit; Rein Company as base unit of employment
- Connectors ISO EF-21 requires study
- 'Beyond or Over the Beach' capability requires study

Potential Decision Point- Accept one or more types of connectors?

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Connector After Next

Concept Based Desired Capabilities

Desired characteristics influence craft design:

(AC) Assault Connector to support landing Assault Echelon

(SC) Support Connector to move bulk capabilities from Sea Base to shore

(B) characteristics desired for both connectors

If a single connector is pursued, all desired characteristics are applicable:

- (AC) High Speed
- (AC) Support splashing/recovery amphibious self-deploying vehicles/small boats
- (AC) Adequate force protection (active/passive)
- (B) Range to conduct distributed/disaggregated operations
- (B) Reliable, maintainable, and sustainable
- (B) Compatible with current/future amphibious shipping
- (B) Joint/combined inter-operable
- (B) Reduced signature
- (B) Sustain long range navigation capability
- (B) Enhanced C2 capability for control
- (B) Rapid loading/unloading capability

What is the Ultra Heavy-Lift Amphibious Connector (UHAC)?

One-Half Scale Demonstrator

Deep water capable

25º Slope & debris-laden shore

Amphibious and all-terrain mobility

HMMWV Payload

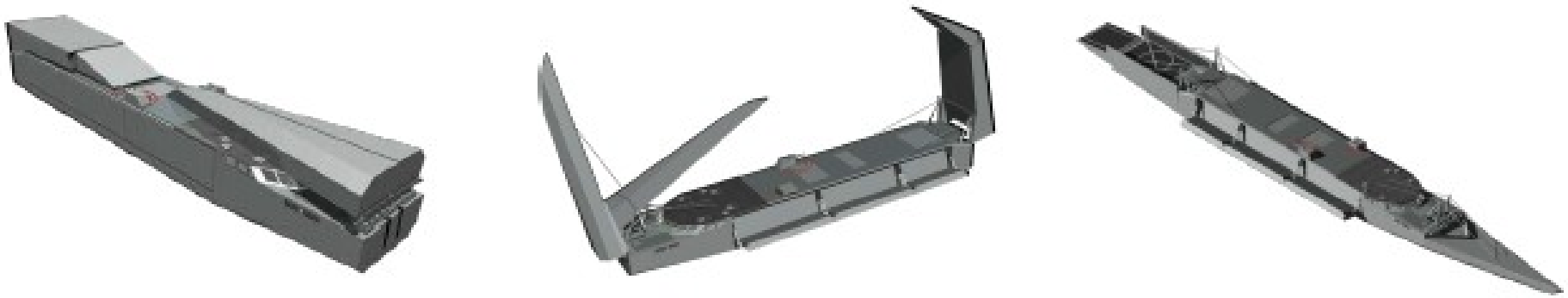
< 2 PSI ground pressure for low-impact environmental missions

Ability to breach landing platform or ice sheet from deep water.

UHAC Demonstration
1/2 Scale Test Results

- Larger scale mobility performance verified
  - Speed/ power (Re-affirmed)
  - Well-deck and MLP deployment and recovery
  - Stable open-ocean transit and 360 rotation maneuver
  - Landing on 25 degree slope, debris-laden shoreline
- Verified infinitely variable transmission low-speed maneuvers and high-speed sprint operation
- Payload (HMMWV) – ballasted to simulate M113, LAV 25, TEU

The Landing Craft Utility - Folding (LCU-F)

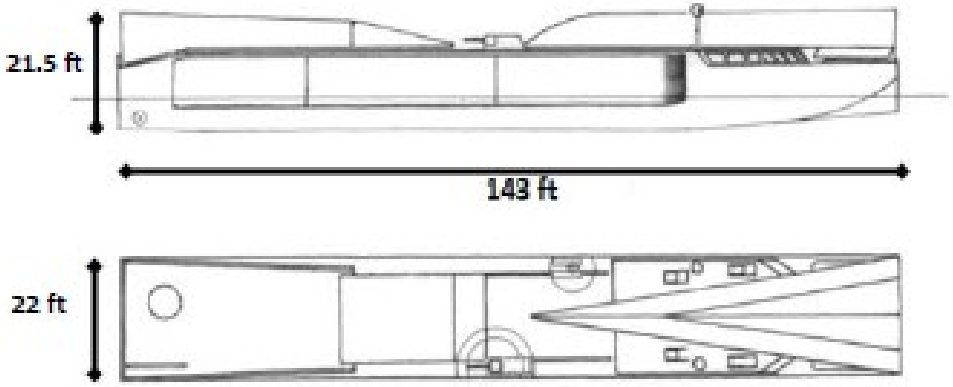


Designed by Phil Bolger and Friends

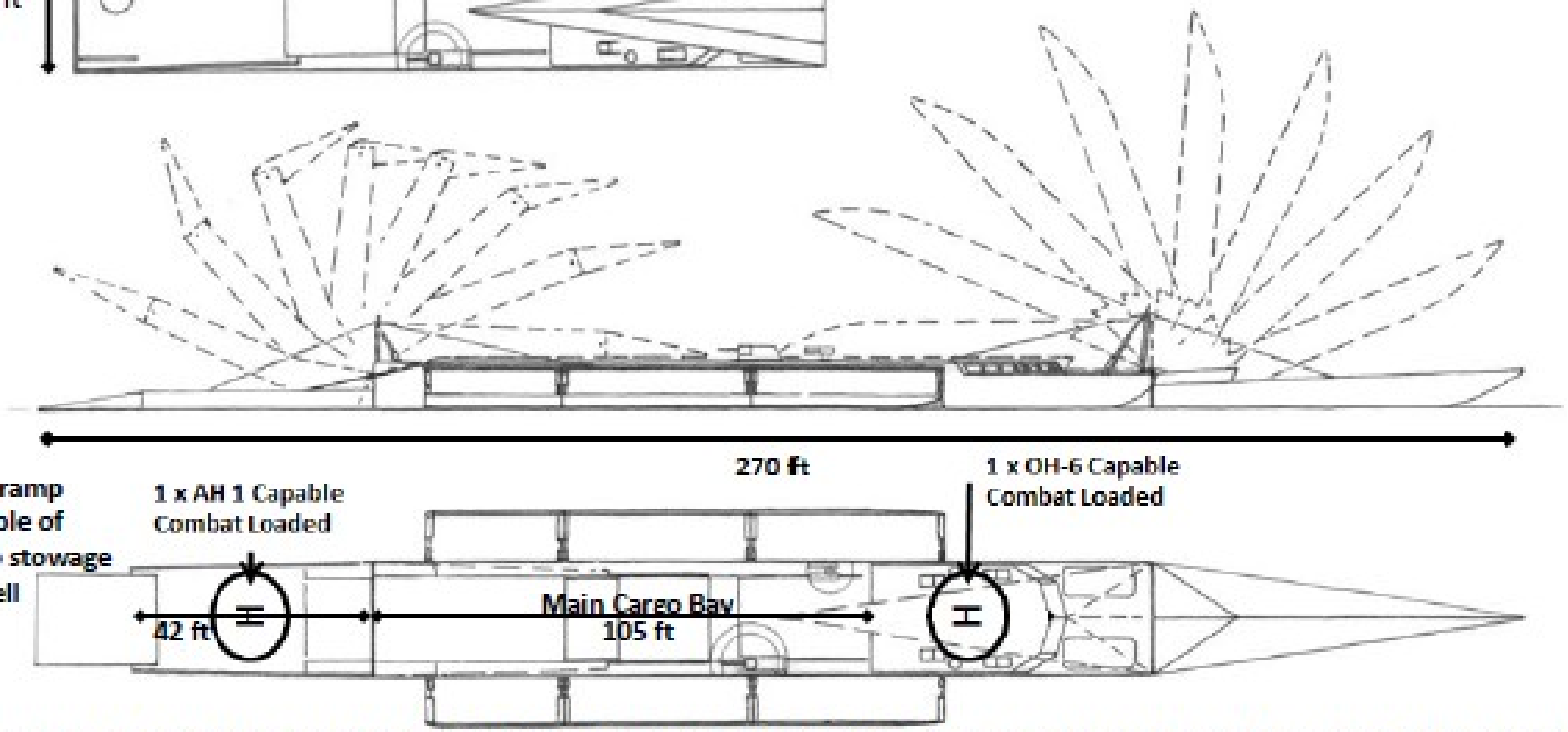
Boatyard

Gloucester, Mass

Proposed LCU-F Design



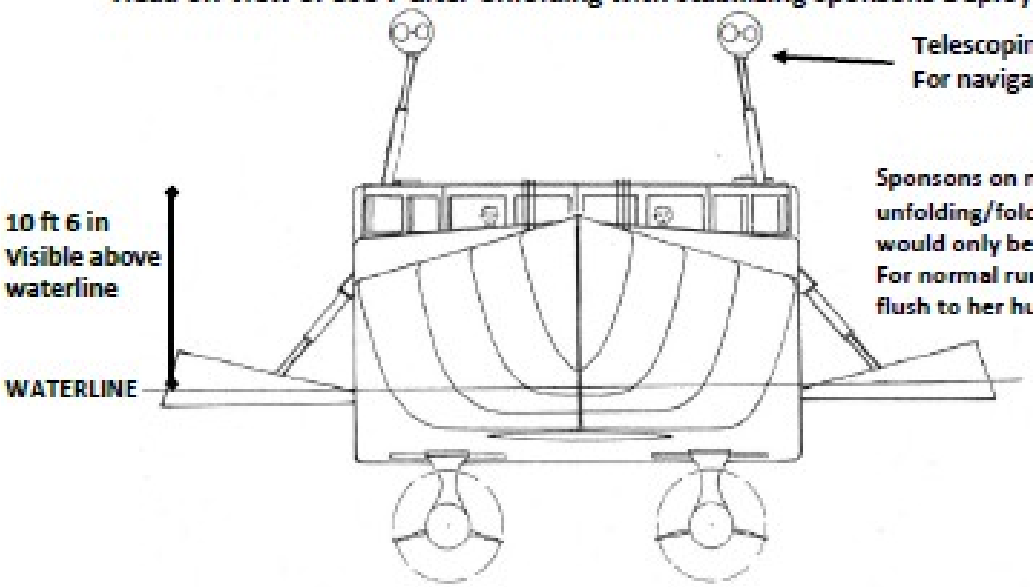
The covered cargo hold allows for clandestine stowage of gear and equipment and the capability to hide capabilities in plain sight


270 ft
Rear ramp capable of cargo stowage as well
1 x AH 1 Capable Combat Loaded
1 x OH-6 Capable Combat Loaded
42 ft
Main Cargo Bay 105 ft

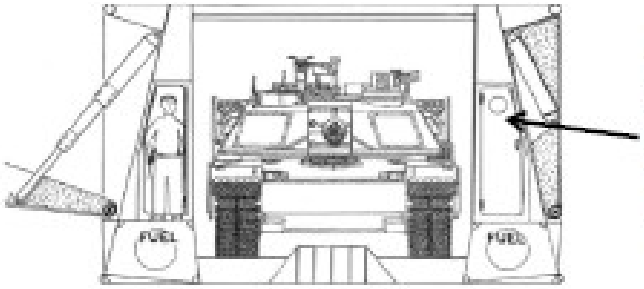
Sponsons on main hull only deploy for the unfolding/folding sequence and to support helo ops; they would only be down during minimal speed movements. For normal running at top speed, they would be retracted flush to her hull.

Proposed LCU-F Design

Head on View of LCU F after Unfolding with Stabilizing Sponsons Deployed

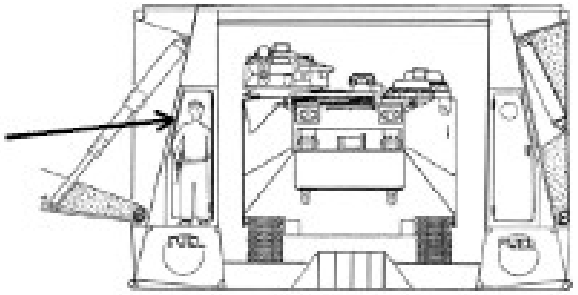

Telescoping and rotating FLIR & Radar
For navigation and situational awareness
Sponsons on main hull only deploy for the unfolding/folding sequence and to support helo ops; they would only be down during minimal speed movements. For normal running at top speed, they would be retracted flush to her hull.
10 ft 6 in
Visible above
waterline
WATERLINE

LCU (F) Midsection Loaded with M1A2 tank and Showing Stabilizer Sponson Stowed and Deployed



The passage way depicted here is open to the cargo bay for personnel movement with doors into the bridge

LCU (F) Midsection Loaded with AAV P7 and Showing Stabilizer Sponson Stowed and Deployed



Characteristic Comparison

- LCU (F) Characteristics
  - Propulsion: 2 x Diesel engines, 1200hp plus 2 x electrically-driven flush 360 degree rotating thrusters
  - Length: 143 ft folded
    270 ft deployed
  - Beam: 22 ft
  - Height: 21.5
  - Draft: folded: 5.5 ft
    unfolded: 4 ft 6 in
  - Displacement: 420 tons
  - Speed: 20 kts at medium load; 19kts at full load
  - Range: 1500 nm on internal fuel at 20 kts
  - Crew: 5
  - Load: 200 tons
  - Military Load: (3) M1A1 or equivalent
  - Armament: Under development because different modular configurations could provide a wide range of armament from MLRS, HIMARs, CIWS, Avenger turrets, small remote turrets (a la remote firing station found currently in inventory)

Mission modules can be inserted/extracted in a roll-in/out fashion inside Amphib well decks, many at MLP, RoRo ramps, and shore bases - with no need for a well-equipped or specially trained personnel or facilities.

Connector Council

CNO	CMC	When/If Required

N95	N42	N81	PP&O	CD&I	PEO (Ships)	ONR	NSWC	Quarterly

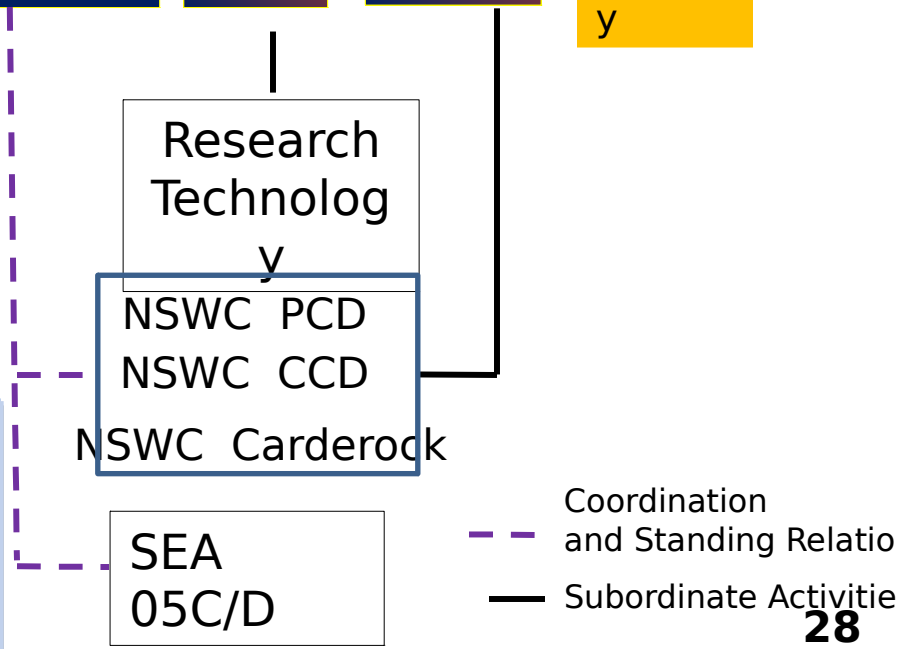
- Serve as the Executive Steering Group (ESG) to discuss findings/proposals as provided by the O6 led Council and provide guidance and approval.

N95 3	N42 2	N81M	POE	SID	PMS-377	ONR	NSWC	Monthly

- O6 level to discuss all facets of future connector analysis and experimentation, facilitate the exchange of new ideas, de-conflict efforts, allow prioritization of analysis, and align our strategic communication efforts relating to connector requirements.
- In advance of Council meetings agenda items, briefs and other products will be provided to the Council members to facilitate discussion.
- Council charter to be developed.

ADHOC Working Groups

Established as required to address specific issues



What is a “Connector”?

Connectors characterize the surface and vertical lift platform capabilities that are a critical component either organic to, or in support of, the sea base to transport personnel, supplies, and equipment within the sea base and maneuver them from the sea base to objectives ashore.

Derived from: Seabasing Joint Integrating Concept (JIC), 2005

Connector Council - Purpose

- Alignment of effort and strategic communications
  - Cross-enterprise engagement and shared awareness
  - Evaluation in the larger context of warfighting needs and fiscal reality
  - Understanding of the Marine Corps' requirements in light of new ACV strategy
  - Seek to maintain unity of effort among all stakeholders
  - Advocacy for current PORs: ensure they remain on Track
  - Determine appropriate pathway to connector "next"

Questions